



Unit 4.8 - Space Physics (Physics Only)

4.8.1. Solar System; Stability of Orbital Motions; Satellites.

4.8.1.1. Our Solar System

a	I know that within our solar system there is one star, the Sun, plus the eight planets and the dwarf planets that orbit around the Sun.			
b	I know that natural satellites, the moons that orbit planets, are also part of the solar system.			
c	I know that our solar system is a small part of the Milky Way galaxy.			
d	I know that the Sun was formed from a cloud of dust and gas (nebula) pulled together by gravitational attraction.			
e	I can explain, how, at the start of a star's life cycle, the dust and gas drawn together by gravity causes fusion reactions and that the fusion reactions lead to an equilibrium between the gravitational collapse of a star and the expansion of a star owing to fusion energy.			

4.8.1.2. The Life Cycle of a Star

a	I know that a star goes through a life cycle that is determined by the size of the star.			
b	I can describe the life cycle of a star that is the same size as the Sun: Nebula – Protostar – Main Sequence Star – Red Giant – White Dwarf – Black Dwarf.			
c	I can describe the life cycle of a star that is much more massive than the Sun: Nebula – Protostar – Main Sequence Star – Red Supergiant – Supernova – Neutron Star or Black Hole (really massive stars).			
d	I know that fusion processes in stars produce all of the naturally occurring elements and that elements heavier than iron are produced in a supernova.			
e	I know that the explosion of a massive star (supernova) distributes the elements throughout the universe.			
f	I can explain how fusion processes lead to the formation of new elements.			

4.8.1.3. Orbital Motion, Natural and Artificial Satellites

a	I know that gravity provides the force that allows planets and satellites (both natural and artificial) to maintain their circular orbits.			
b	I can describe the similarities and distinctions between the planets, their moons, and artificial satellites (HT only).			
c	I can explain qualitatively how, for circular orbits, the force of gravity can lead to changing velocity but unchanged speed (HT Only).			
d	I can explain qualitatively how, for a stable orbit, the radius must change if the speed changes (HT Only).			



4.8.2. Red Shift

a	I know that there is an observed increase in the wavelength of light from most distant galaxies and that the further away the galaxies, the faster they are moving and the bigger the observed increase in wavelength. This effect is called red-shift.			
b	I know that the observed red-shift provides evidence that space itself (the universe) is expanding and supports the Big Bang theory.			
c	I know that the Big Bang theory suggests that the universe began from a very small region that was extremely hot and dense.			
d	I know that, since 1998 onwards, observations of supernovae suggest that distant galaxies are receding ever faster.			
e	I can explain, qualitatively, the red-shift of light from galaxies that are receding.			
f	I can explain that the change of each galaxy's speed with distance is evidence of an expanding universe.			
g	I can explain how red-shift provides evidence for the Big Bang model.			
h	I can explain how scientists are able to use observations to arrive at theories such as the Big Bang theory.			
i	I can explain that there is still much about the universe that is not understood, for example dark mass and dark energy.			